

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平 8 - 2 0 2 9 0 7

(43) 公開日 平成 8 年 (1996) 8 月 9 日

(51) Int. Cl. ⁶

G07B 15/00

識別記号

510

庁内整理番号

A

F I

技術表示箇所

審査請求 未請求 請求項の数 1 O L (全 5 頁)

(21) 出願番号

特願平 7 - 8 8 2 3

(22) 出願日

平成 7 年 (1995) 1 月 2 4 日

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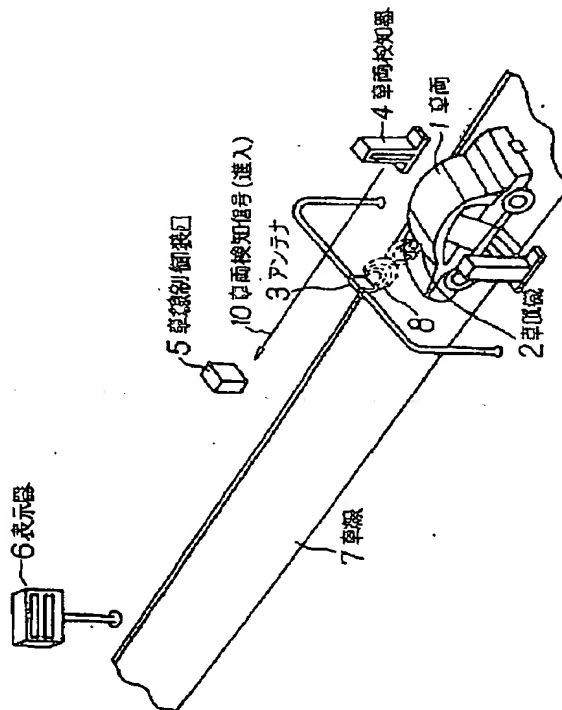
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(54) 【発明の名称】 有料道路の料金收受システム

(57) 【要約】

【目的】 有料道路の料金收受システムに関し、車載機がなく、又は車載機故障車両の場合には表示器へ表示する。

【構成】 車線 7 へ車載機 2 を搭載した車両 1 が走行し、車両検知器 4 がその進入を検知し、車両検知信号 (進入) 10 を車線制御装置 5 へ送る。車線制御装置 8 は信号 10 とアンテナ 3 が車載機 2 と電波 8 により無線通信を行うまでのタイミングを測定し、一定時間内に通信がなければ車載機なし、又は故障とみなし、表示器 6 へ故障の表示を行うので故障車両へ適切に通知できる。



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【特許請求の範囲】

【請求項1】 有料道路料金所の路上に設置され、車両に搭載されて無線通信手段を備えた車載機との間で無線通信を行うアンテナと、料金所に進入してくる車両の進入を検知する車両検知器と、料金所の路上に設置され、前記車載機とアンテナ間のデータ通信結果を運転者へ通知するための表示器と、前記アンテナ、車両検知器及び表示器に接続し、これらを制御する車線制御装置とを具備してなり、前記車線制御装置は前記車両検知器からの車両進入信号を受け、同信号から所定の時間内に前記アンテナと車載機との無線通信が行われるか否かを計測し、同時間内に無線通信が行われない場合には前記進入した車両には車載機を搭載していないか、又は故障しているを見なし、前記表示器に表示するように制御することを特徴とする有料道路の料金收受システム。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は有料道路の料金收受システムに関する。

【0002】

【従来の技術】 従来、有料道路の料金收受システムでは、料金所で収受員がドライバから現金を直接収受したり、或いは、ドライバに現金を自動機に投入させて自動的に料金を収受させる方法が採用されている。この為、ドライバは、料金所で一旦停止し、現金を用意する必要があった。

【0003】 これに対して、料金所での現金の受渡しの必要のない近未来の料金收受システムとして、ID情報、料金情報を記録し、外部と無線通信可能な非接触式ICカード等の車載機を車両に搭載し、外部のアンテナと無線通信を行い、車載機の料金情報に基づいて料金收受を行うシステムが開発されている。

【0004】 図3はこのような従来の無線を利用した料金收受システムの斜視図である。図において、車線7には車両1が走行し、料金所へ進入しており、車両1は車載機2を搭載している。車載機2にはID番号、金額データが記録されており、路上のアンテナ3と電波8により無線通信を行う。4は車両検知器で車両1の通過を検知し、車両検知信号20を車線制御装置5へ送信する。6は表示器で料金情報、等を表示するものである。

【0005】 このような構成の料金收受システムにおいて、有料道路の車線7を走行する車両1が料金所に進入し、車両検知器4を車両1が通過、完了することで車両検知器4より車線制御装置5へ車両検知信号20が送信される。車線制御装置5は車両検知信号20を受信することで、アンテナ3より電波8を発射する。

【0006】 車両1に搭載された車載機2がアンテナ3に近づくと、この電波8を受け、アンテナ3～車載機2間で無線通信が行われ、あらかじめ車載機2内のメモリに記憶されているID番号をチェックし、正常であれば

車載機2の金額データより通行料金を引き去り、残金額や通行料金を表示器6に表示することで、運転者へ通信結果を通知する。

【0007】 又、ID番号をチェックした結果、紛失届けのあった車載機2の場合や、金額が不足している場合は、表示器6にてその旨を表示し、運転者へ通知する。

【0008】

【発明が解決しようとする課題】 このような従来の料金收受システムにおいては、アンテナ3と車載機2間の無線通信が行われれば、その直後に処理結果を表示器6に表示することで、運転者へ通知することは可能であるが、車載機2を有しない車両又は車載機2が故障した車両が通過した場合、アンテナ3と車載機2間で無線通信が行われない為、表示器6にその処理結果を表示することが出来ず、運転者へ通知されないことになる。

【0009】 本発明はこのような課題に対し、無線通信による料金收受システムにおいて、車載機を有しない車両又は車載機が故障した車両に対しても異常であることを適切なタイミングで運転者に表示することのできる料金收受システムを提供することを目的としている。

【0010】

【課題を解決するための手段】 そのため、本発明は、車載機と無線通信を行うアンテナ、進入する車両を検知する車両検知器、表示器及びこれらを制御する車線制御装置とを備え、車線制御装置は車両の進入と車載機がアンテナと無線通信を行うまでのタイミングを計測し、所定の時間内に無線通信が行われない場合には、車載機を有しない車両又は車載機が故障しているを見なしして異常である旨表示器へ表示するように制御する構成とする。

【0011】 即ち、本発明は、有料道路料金所の路上に設置され、車両に搭載されて無線通信手段を備えた車載機との間で無線通信を行うアンテナと、料金所に進入してくる車両の進入を検知する車両検知器と、料金所の路上に設置され、前記車載機とアンテナ間のデータ通信結果を運転者へ通知するための表示器と、前記アンテナ、車両検知器及び表示器に接続し、これらを制御する車線制御装置とを具備してなり、前記車線制御装置は前記車両検知器からの車両進入信号を受け、同信号から所定の時間内に前記アンテナと車載機との無線通信が行われるか否かを計測し、同時間内に無線通信が行われない場合には前記進入した車両には車載機を搭載していないか、又は故障しているを見なし、前記表示器に表示するように制御することを特徴とする有料道路の料金收受システムを提供する。

【0012】

【作用】 本発明はこのような手段により、車両が進入すると車両検知器がその進入を検知し、車線制御装置へその信号を送信する。車線制御装置はこの信号を受けるとアンテナに指令し、アンテナは車載機に対して問合せの電波を発射する。車両に車載機がないか、又は車載機が

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故障している場合には、アンテナとの間で無線通信が行われないので車線制御装置は車両進入時より一定の時間を定め、この時間内に無線通信が行われないと車載機がないか、又は車載機故障と見なしてこの旨、表示器に表示するように制御する。この一定時間のタイミングは、車線制御装置において最新の計測データの件数で車両進入から無線通信が行われるタイミングの平均値を計算し、常時最新の現状データに更新して一定時間を定めるようにするので正確な判断がなされ、表示される。

【0013】このように、本発明により、車載機を有しない車両又は車載機故障車両に対し、適切なタイミングで表示器に異常情報を表示出来、運転者へ通知することが可能となる。

【0014】

【実施例】以下、本発明の実施例を図面に基づいて具体的に説明する。図1は本発明の一実施例に係る有料道路の料金収受システムの斜視図である。図において、1は車線7を走行し、進入してくる車両、2は車両1に搭載された車載機、3は路上側に設置されたアンテナ、4は車両1の進入を検知する車両検知器、5は車線制御装置、6は表示器、8はアンテナ3と車載機2間の無線通信を行う電波、10は車両検知器4の検知した車両検知信号(進入)である。

【0015】このような構成の料金収受システムにおいて、有料道路を通行する車両1が、料金所に進入し、車両検知器4に車両1が進入することで車両検知器4より車線制御装置5へ車両検知信号(進入)10が送信される。車線制御装置5は、車両検知信号(進入)10を受信することで、アンテナ3より電波8を発射する。

【0016】車両1に搭載された車載機2とアンテナ3との間で無線通信が行われ、あらかじめ車載機2内のメモリに記憶されているID番号等をチェックし、正常であれば車載機2の金額データより通行料金を引き去り、残金額や通行料金を表示器6に表示することで、運転者へ通信結果を通知する。又、ID番号をチェックした結果、紛失届けのあった車載機の場合や、金額が不足している場合は表示器6にてその旨を表示し、運転者へ通知する。

【0017】次に、本発明の特徴となる車載機2を有しない車両又は車載機2が故障している車両の場合について詳しく説明する。図1において、車載機2を有しない車両又は車載機2が故障している車両が車両検知器4に進入すると車両検知信号(進入)10が車線制御装置5に送信され、アンテナ3より電波8を発射する。しかし、車両には車載機2が無い又は故障している為、アンテナ3との間で無線通信が行われず、通信結果を表示器6に表示することが出来ない為、運転者へ通知することが出来ない。

【0018】そこで、この様な車両に対しては、車両検知信号(進入)10を受信してからある一定時間「A」

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内にアンテナ3と車載機2間にて通信が行われない場合は、車載機2を有しない車両又は故障している車両と判断し、その旨を表示器6に表示することで、運転者へ通知する方法が考えられるが、車両の走行状態(渋滞、ノンストップ等)により、一定時間「A」を決定することが難しい。

【0019】例えば、朝夕の通勤ラッシュ時には、一定時間「A」が短かすぎると正常な車載機2を有した車両が徐行で走行した場合、車載機2を有しない車両と誤判別する。又、夜間の交通量が少ない場合は、ノンストップな高速走行が行われる為、一定時間「A」が長すぎると、車載機2を有しない車両又は、故障した車両に対し、表示器6を通過した後に、異常な旨を表示される為、運転者へ通知することが出来ないことになる。

【0020】そこで車両検知信号(進入)10と、アンテナ3と車載機2との間の無線通信結果とのタイミングを測定し、車両の走行状態を判断し、一定時間「A」を決定するようにすれば前述の問題を解決することができる。この一定時間「A」の決定方法について図3のタイミングチャートに従って以下に説明する。

【0021】図3は、車両検知器4から出力される車両検知信号(進入)10とアンテナ3と車載機2間の無線通信のタイミングを示すものであり、(a)は高速走行の場合、(b)は低・中速走行の場合のものである。図3のxは、車両検知信号(進入)10の開始時点から無線通信開始までのタイミングであり、このタイミングxは車両毎又は車両の走行状態により異なった値となる。一般に、高速走行時と低・中速走行時のタイミングは、 x_1 、 $x_2 < x_3$ 、 x_4 の関係にある。

【0022】車線制御装置5にて、この2つのタイミングxを通常車載機2を有する車両に対し、計測することで一定時間「A」の値を算出し、決定する。算出式の一例を次に示す。

【0023】

【数1】

$$A = a \frac{\sum_{i=1} x_i}{i}$$

【0024】aは係数であり、 $1 \leq a$ とし、iは最新の計測データからの件数である。最新計測データi件分のタイミングxの平均を取り、係数aをかけることで一定時間「A」を算出する。この一定時間「A」は又、逐次新しい値に更新するようにすれば車両走行状態に適したタイミングxが常時得られ、このようなタイミングxで無線通信を行えば車載機の搭載していない車両又は車載機の故障している車両を判定し、表示器6にその旨表示することができる。

【0025】このような実施例の料金収受システムにおいては、車両検知器4では車両1の進入を検知するようにし、この車両検知信号(進入)10とアンテナ3と車

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載機2の無線通信のタイミングを車線制御装置5で測定し、最新計測データの件数でタイミングの平均を求めて一定時間「A」を算出するようにしたので、従来と機器構成は車両検知器4の位置をアンテナ3の通信領域に近づけるようにするだけで変更することなく、車載機を有しない車両又は車載機が故障している車両に対してもこれを判別し、表示器6に車載機の異常情報を表示することができ、運転者へも通知することが可能となる。

【0026】

【発明の効果】以上、具体的に説明したように本発明は、車載機と無線通信を行うアンテナ、進入する車両を検知する車両検知器、表示器及びこれらを制御する車線制御装置とを備え、車線制御装置は車両の進入と車載機がアンテナと無線通信を行うまでのタイミングを計測し、所定の時間内に無線通信が行われない場合には、車載機を有しない車両又は車載機が故障しているとし、異常である旨表示器へ表示するように制御する構成としたので、従来の機器構成を変更することなく、車載機

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を有しない車両又は故障車両に対しても最適な表示タイミングにて、表示することが可能となる。

【図面の簡単な説明】

【図1】本発明の一実施例に係る有料道路の料金収受システムの斜視図である。

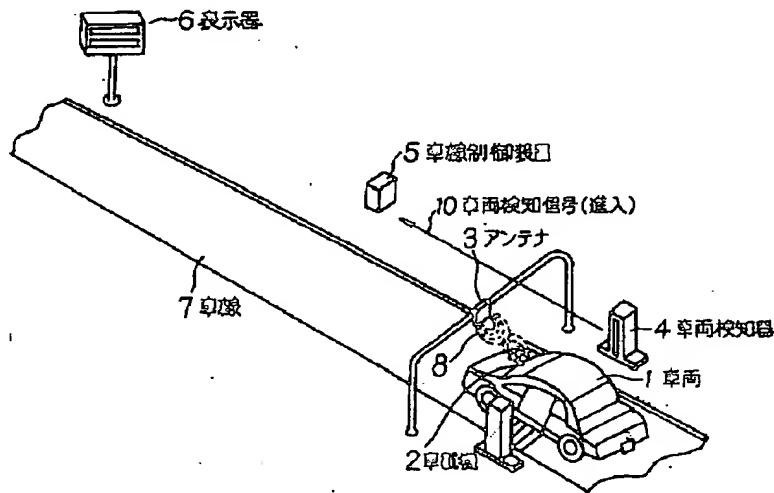
【図2】本発明の一実施例に係る車両検知信号と無線通信のタイミングチャートで、(a)は車両の高速走行の場合、(b)は低、中速走行の場合を示す。

【図3】従来の有料道路の料金収受システムの斜視図である。

【符号の説明】

- 1 車両
- 2 車載機
- 3 アンテナ
- 4 車両検知器
- 5 車線制御装置
- 6 表示器
- 7 車線

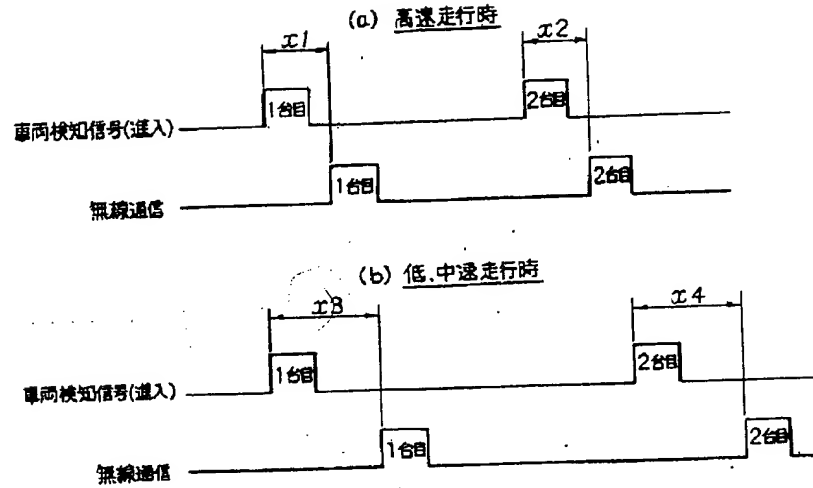
【図1】



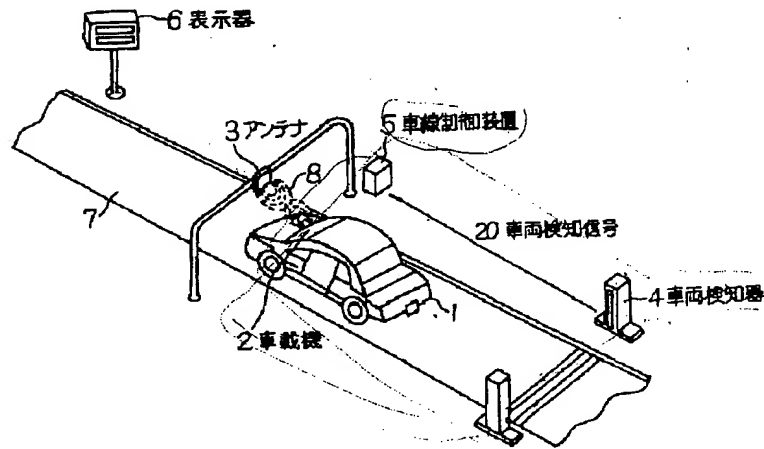
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【図2】



【図3】



PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-202907

(43)Date of publication of application : 09.08.1996

(51)Int.Cl. G07B 15/00
G07B 15/00

(21)Application number : 07-008823

(71)Applicant : MITSUBISHI HEAVY IND LTD

(22)Date of filing : 24.01.1995

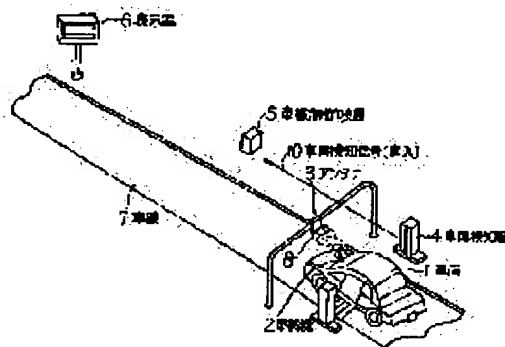
(72)Inventor : YASUI MASAYUKI
NAKANE TAKEHIRO

(54) CHARGE RECEIVING SYSTEM OF TOLL BOARD

(57)Abstract:

PURPOSE: To display charge on a display device when there is no on-vehicle equipment or on-vehicle equipment is failed.

CONSTITUTION: When a vehicle 1 mounting an on-vehicle equipment 2 is traveling on a lane 7, a vehicle detector 4 detects the entry of the vehicle 1 and sends a vehicle detection signal (entry) 10 to a lane controller 5. The controller 5 measures the signal 10 and timing up to the start of radio communication through a radio wave between an antenna 3 and the equipment 2, and when communication is not started within a fixed time, recognized no on-vehicle equipment or the existence of the failed on-vehicle equipment and displays the failure on a display device 6, so that the failed vehicle can be properly informed of the failure.



LEGAL STATUS

[Date of request for examination] 05.06.1998

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number] 3095652

[Date of registration] 04.08.2000

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

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CLAIMS

[Claim(s)]

[Claim 1] The antenna which performs a radio between the mounted machines which are installed in on the street [of a toll-road tollgate], are carried in a vehicle, and were equipped with the radio means, The vehicle detector which detects an entry of the vehicle which advances into a tollgate, and the drop for being installed in on the street [of a tollgate] and notifying an operator of the data communication result between the aforementioned mounted machine and an antenna, It comes to provide the lane control unit which connects with the aforementioned antenna, a vehicle detector, and a drop, and controls these. The aforementioned lane control unit receives the vehicle entry signal from the aforementioned vehicle detector, and it measures whether the radio of the aforementioned antenna and a mounted machine is performed within predetermined time from this signal. The tariff **** system of the toll road characterized by controlling to consider that the mounted machine is not carried in the vehicle which carried out [aforementioned] the entry, or it is out of order when there is no radio within between simultaneous a line crack, and to display on the aforementioned drop.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] this invention relates to the tariff **** system of a toll road.

[0002]

[Description of the Prior Art] Conventionally, in the tariff **** system of a toll road, a **** member carries out the direct requisition carrier of the cash from a driver in a tollgate, or the method of making an automatic machine invest cash in a driver, and making a tariff **** automatically is adopted. For this reason, it needed to stop in the tollgate and the driver needed to prepare cash.

[0003] On the other hand, the system which records ID information and a tariff information, carries mounted machines, such as the exterior and a noncontact IC card which can be radiocommunicated, in a vehicle, performs an external antenna and an external radio, and performs tariff **** based on the tariff information on a mounted machine as a tariff **** system of the near future without the need for delivery of the cash in a tollgate is developed.

[0004] Drawing 3 is a perspective diagram of a tariff **** system using such a conventional radio. In drawing, a vehicle 1 runs into a lane 7, it is advancing to the tollgate, and the vehicle 1 carries the mounted machine 2. An identification number and amount-of-money data are recorded on the mounted machine 2, and an antenna 3 and Hertzian wave 8 on the street perform a radio. 4 detects transit of a vehicle 1 in a vehicle detector, and transmits the vehicle detection signal 20 to the lane control unit 5. 6 displays a tariff information etc. with a drop.

[0005] In the tariff **** system of such a configuration, the vehicle 1 which runs the lane 7 of a toll road advances into a tollgate, and the vehicle detection signal 20 is transmitted to the lane control unit 5 from the vehicle detector 4 by a vehicle 1 passing and completing the vehicle detector 4. The lane control unit 5 is receiving the vehicle detection signal 20, and discharges Hertzian wave 8 from an antenna 3.

[0006] If the mounted machine 2 carried in the vehicle 1 approaches an antenna 3, this Hertzian wave 8 is received, a radio is performed between the antenna 3 – the mounted machine 2, the identification number beforehand memorized by the memory in the mounted machine 2 is checked, if normal, a toll will be deducted from the amount-of-money data of the mounted machine 2, and an operator will be notified of a communication result by displaying a balance frame and a toll on a drop 6.

[0007] Moreover, the case of the mounted machine 2 which had the report of the loss of an article as a result of checking an identification number, and when the amount of money is insufficient, the purport is displayed with a drop 6 and an operator is notified.

[0008]

[Problem(s) to be Solved by the Invention] In such a conventional tariff **** system, if the radio between an antenna 3 and the mounted machine 2 is performed, although it is displaying a processing result on a drop 6 just behind it and it is possible to notify an operator Since a radio is not performed between an antenna 3 and the mounted machine 2 when the vehicle with which the vehicle or the mounted machine 2 which does not have the mounted machine 2 broke down passes, the processing result cannot be displayed on a drop 6, but an operator will be notified.

[0009] this invention aims at offering the tariff **** system which can display an unusual thing on an operator to suitable timing also to the vehicle with which the vehicle or the mounted machine which does not have a mounted machine broke down in the tariff **** system by the radio to such a technical problem.

[0010]

[Means for Solving the Problem] Therefore, the antenna with which this invention performs a mounted machine and a radio, the vehicle detector which detects the vehicle which advances, Have the lane control unit which controls a drop and these, and a lane control unit measures timing until an entry and the mounted machine of a vehicle perform an antenna and a radio. When there is no radio within predetermined time a line crack, it considers as the configuration controlled to consider that the vehicle or the mounted machine which does not have a mounted machine is out of order, and to display on an unusual purport drop.

[0011] Namely, the antenna which performs a radio between the mounted machines which this invention is installed in on the street [of a toll-road tollgate], are carried in a vehicle, and were equipped with the radio means, The vehicle detector which detects an entry of the vehicle which advances into a tollgate, and the drop for being installed in on the street [of a tollgate] and notifying an operator of the data communication result between the aforementioned mounted machine and an antenna, It comes to provide the lane control unit which connects with the aforementioned antenna, a vehicle detector, and a drop, and controls these. The aforementioned lane control unit receives the vehicle entry signal from the aforementioned vehicle detector, and it measures whether the radio of the aforementioned antenna and a mounted machine is performed within predetermined time from this signal. When there is no radio within between simultaneous a line crack, it considers that the mounted machine is not carried in the vehicle which carried out [aforementioned] the entry, or it is out of order, and the tariff **** system of the toll road characterized by controlling to display on the aforementioned drop is offered.

[0012]

[Function] By such means, a vehicle detector will detect the entry and this invention will transmit the signal to a lane control unit, if a vehicle advances. If a lane control unit receives this signal, an antenna will be ordered and an antenna will discharge the Hertzian wave of an inquiry to a mounted machine. Since a radio is not performed between antennas when there is no mounted machine in a vehicle or the mounted machine is out of order, a lane control unit will be controlled for there to be no mounted machine, or to regard it as mounted machine failure, and to display on this purport and a drop, if the time when it is more fixed than the time of a vehicle entry is set and a radio is not performed to within a time [this]. The timing of this fixed time calculates the average of the timing to which a radio is performed from a vehicle entry by the number of cases of the newest instrumentation data in a lane control unit, and since it updates to the present condition data of the regular newest and fixed time is set, exact decision is made and it is displayed.

[0013] Thus, by this invention, to the vehicle or the mounted machine failure vehicle which does not have a mounted machine, an unusual information can be expressed to a drop as suitable timing, and it is enabled to notify an operator.

[0014]

[Example] Hereafter, the example of this invention is concretely explained based on a drawing. Drawing 1 is a perspective diagram of the tariff **** system of the toll road concerning one example of this invention. The Hertzian wave to which a lane control unit and 6 carry out a drop, and, as for 8, the vehicle which 1 runs a lane 7 in drawing and advances, the mounted machine with which 2 was carried in the vehicle 1, the antenna with which 3 was installed in the on-the-street side, the vehicle detector in which 4 detects an entry of a vehicle 1, and 5 carry out the radio between an antenna 3 and the mounted machine 2, and 10 are the vehicle detection signals (entry) which the vehicle

[0015] In the tariff **** system of such a configuration, the vehicle detection signal (entry) 10 is transmitted to the lane control unit 5 from the vehicle detector 4 by the vehicle 1 which passes through a toll road advancing into a tollgate, and a vehicle 1 advancing into the vehicle detector 4. The lane control unit 5 is receiving the vehicle detection signal (entry) 10, and discharges

Hertzian wave 8 from an antenna 3.

[0016] A radio is performed between the mounted machines 2 and the antennas 3 which were carried in the vehicle 1, the identification number beforehand memorized by the memory in the mounted machine 2 is checked, if normal, a toll will be deducted from the amount-of-money data of the mounted machine 2, and an operator is notified of a communication result by displaying a balance frame and a toll on a drop 6. Moreover, as a result of checking an identification number, the case of the mounted machine with the report of the loss of an article, and when the amount of money is insufficient, the purport is displayed with a drop 6, and an operator is notified.

[0017] Next, the case where it is the vehicle with which the vehicle or the mounted machine 2 which does not have the mounted machine 2 used as the characteristic feature of this invention is out of order is explained in detail. In drawing 1, if the vehicle with which the vehicle or the mounted machine 2 which does not have the mounted machine 2 is out of order advances into the vehicle detector 4, it will be transmitted to the lane control unit 5, and the vehicle detection signal (entry) 10 will discharge Hertzian wave 8 from an antenna 3. However, since a radio is not performed between antennas 3 since there is no mounted machine 2 in a vehicle or it is out of order, and a communication result cannot be displayed on a drop 6, an operator cannot be notified.

[0018] Then, after receiving the vehicle detection signal (entry) 10 to such a vehicle, when a communication is not performed between an antenna 3 and the mounted machine 2 within a certain fixed time "A" Although the technique of notifying an operator can be considered by judging it as the vehicle which does not have the mounted machine 2, or a damaged vehicle, and displaying the purport on a drop 6, it is difficult to decide on fixed time "A" by the run states (traffic congestion, nonstop, etc.) of a vehicle.

[0019] For example, at the time of commutation rushes in the mornings and evenings, when the vehicle with short ** past ** and the normal mounted machine 2 in fixed time "A" runs by going slowly, it carries out a vehicle [which does not have the mounted machine 2], and misjudgment exception. Moreover, since an unusual purport will be displayed after passing a drop 6 to the vehicle which does not have the mounted machine 2, or the damaged vehicle if fixed time "A" is too long, since a nonstop high-speed run is performed when there are few traffic flows of night, an operator can be notified.

[0020] Then, the timing with the radio result between the vehicle detection signal (entry) 10, and an antenna 3 and the mounted machine 2 is measured, the run state of a vehicle is judged, and if it decides on fixed time "A", the above-mentioned problem is solvable. The decision technique of this fixed time "A" is explained below according to the ***** chart of drawing 3.

[0021] Drawing 3 shows the timing of the radio between the vehicle detection signal (entry) 10 and the antenna 3 which are outputted from the vehicle detector 4, and the mounted machine 2, and, in a high-speed run, (b) of (a) is a thing in low and a medium-speed run. x of drawing 3 is ***** from the start point in time of the vehicle detection signal (entry) 10 to radio start, and this timing x serves as the value which changed with run states of every vehicle and a vehicle. Generally, ***** at the time of a high-speed run, and low and a medium-speed run is in the relation of x_1 , $x_2 < x_3$, and x_4 .

[0022] The value of fixed time "A" is computed and determined by measuring these two ***** x with the lane control unit 5 to the vehicle which usually has the mounted machine 2. An example of a calculation formula is shown below.

[0023]

[Equation 1]

$$A = a \frac{\sum_{i=1}^i x_i}{i}$$

[0024] a is a coefficient, and sets to $1 \leq a$, and i is the number of cases from the newest instrumentation data. An average of ***** x for the i newest instrumentation data is taken, and fixed time "A" is computed by applying coefficient a. the vehicle with which the vehicle which a mounted machine does not carry if timing x which was suitable for the vehicle run state

when updating this fixed time "A" to the new value again serially is always obtained and performs a radio by such timing x, or the mounted machine is out of order -- judging -- a drop 6 -- the -- a purport display can be carried out

[0025] In the tariff **** system of such an example In the vehicle detector 4, detect an entry of a vehicle 1, and the timing of the radio of this vehicle detection signal (entry) 10 and antenna 3, and the mounted machine 2 is measured with the lane control unit 5. Since fixed time "A" was computed in quest of the average of timing by the number of cases of the newest instrumentation data The former and configuration, without changing only by bringing the position of the vehicle detector 4 close to the communication region of an antenna 3 This can be distinguished also to the vehicle with which the vehicle or the mounted machine which does not have a mounted machine is out of order, the unusual information on a mounted machine can be displayed on a drop 6, and it is enabled to also notify an operator.

[0026]

[Effect of the Invention] As mentioned above, the antenna with which this invention performs a mounted machine and a radio as explained concretely, It has the lane control unit which controls the vehicle detector, the drop, and these which detect the vehicle which advances. When a lane control unit measures timing until an entry and the mounted machine of a vehicle perform an antenna and a radio and a radio is not performed within predetermined time It is enabled to express as the optimum display timing also to the vehicle or failure vehicle which does not have a mounted machine, without changing the conventional configuration, since it considered as the configuration controlled to consider that the vehicle or the mounted machine which does not have a mounted machine is out of order, and to display on an unusual purport drop.

[Translation done.]

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Field

[Field of the Invention] this invention relates to the tariff **** system of a toll road.

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Technique

[Description of the Prior Art] Conventionally, in the tariff **** system of a toll road, a **** member carries out the direct requisition carrier of the cash from a driver in a tollgate, or the method of making an automatic machine invest cash in a driver, and making a tariff **** automatically is adopted. For this reason, it needed to stop in the tollgate and the driver needed to prepare cash.

[0003] On the other hand, the system which records ID information and a tariff information, carries mounted machines, such as the exterior and a noncontact IC card which can be radiocommunicated, in a vehicle, performs an external antenna and an external radio, and performs tariff **** based on the tariff information on a mounted machine as a tariff **** system of the near future without the need for delivery of the cash in a tollgate is developed.

[0004] Drawing 3 is a perspective diagram of a tariff **** system using such a conventional radio. In drawing, a vehicle 1 runs into a lane 7, it is advancing to the tollgate, and the vehicle 1 carries the mounted machine 2. An identification number and amount-of-money data are recorded on the mounted machine 2, and an antenna 3 and Hertzian wave 8 on the street perform a radio. 4 detects transit of a vehicle 1 in a vehicle detector, and transmits the vehicle detection signal 20 to the lane control unit 5. 6 displays a tariff information etc. with a drop.

[0005] In the tariff **** system of such a configuration, the vehicle 1 which runs the lane 7 of a toll road advances into a tollgate, and the vehicle detection signal 20 is transmitted to the lane control unit 5 from the vehicle detector 4 by a vehicle 1 passing and completing the vehicle detector 4. The lane control unit 5 is receiving the vehicle detection signal 20, and discharges Hertzian wave 8 from an antenna 3.

[0006] If the mounted machine 2 carried in the vehicle 1 approaches an antenna 3, this Hertzian wave 8 is received, a radio is performed between the antenna 3 - the mounted machine 2, the identification number beforehand memorized by the memory in the mounted machine 2 is checked, if normal, a toll will be deducted from the amount-of-money data of the mounted machine 2, and an operator will be notified of a communication result by displaying a balance frame and a toll on a drop 6.

[0007] Moreover, the case of the mounted machine 2 which had the report of the loss of an article as a result of checking an identification number, and when the amount of money is insufficient, the purport is displayed with a drop 6 and an operator is notified.

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Effect

[Effect of the Invention] As mentioned above, the antenna with which this invention performs a mounted machine and a radio as explained concretely, It has the lane control unit which controls the vehicle detector, the drop, and these which detect the vehicle which advances. When a lane control unit measures timing until an entry and the mounted machine of a vehicle perform an antenna and a radio and a radio is not performed within predetermined time It is enabled to express as the optimum display timing also to the vehicle or failure vehicle which does not have a mounted machine, without changing the conventional configuration, since it considered as the configuration controlled to consider that the vehicle or the mounted machine which does not have a mounted machine is out of order, and to display on an unusual purport drop.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] In such a conventional tariff **** system, if the radio between an antenna 3 and the mounted machine 2 is performed, although it is displaying a processing result on a drop 6 just behind it and it is possible to notify an operator Since a radio is not performed between an antenna 3 and the mounted machine 2 when the vehicle with which the vehicle or the mounted machine 2 which does not have the mounted machine 2 broke down passes, the processing result cannot be displayed on a drop 6, but an operator will be notified. [0009] this invention aims at offering the tariff **** system which can display an unusual thing on an operator to suitable timing also to the vehicle with which the vehicle or the mounted machine which does not have a mounted machine broke down in the tariff **** system by the radio to such a technical problem.

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MEANS

[Means for Solving the Problem] Therefore, the antenna with which this invention performs a mounted machine and a radio, the vehicle detector which detects the vehicle which advances, Have the lane control unit which controls a drop and these, and a lane control unit measures timing until an entry and the mounted machine of a vehicle perform an antenna and a radio. When there is no radio within predetermined time a line crack, it considers as the configuration controlled to consider that the vehicle or the mounted machine which does not have a mounted machine is out of order, and to display on an unusual purport drop.

[0011] Namely, the antenna which performs a radio between the mounted machines which this invention is installed in on the street [of a toll-road tollgate], are carried in a vehicle, and were equipped with the radio means, The vehicle detector which detects an entry of the vehicle which advances into a tollgate, and the drop for being installed in on the street [of a tollgate] and notifying an operator of the data communication result between the aforementioned mounted machine and an antenna, It comes to provide the lane control unit which connects with the aforementioned antenna, a vehicle detector, and a drop, and controls these. The aforementioned lane control unit receives the vehicle entry signal from the aforementioned vehicle detector, and it measures whether the radio of the aforementioned antenna and a mounted machine is performed within predetermined time from this signal. When there is no radio within between simultaneous a line crack, it considers that the mounted machine is not carried in the vehicle which carried out [aforementioned] the entry, or it is out of order, and the tariff **** system of the toll road characterized by controlling to display on the aforementioned drop is offered.

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OPERATION

[Function] By such means, a vehicle detector will detect the entry and this invention will transmit the signal to a lane control unit, if a vehicle advances. If a lane control unit receives this signal, an antenna will be ordered and an antenna will discharge the Hertzian wave of an inquiry to a mounted machine. Since a radio is not performed between antennas when there is no mounted machine in a vehicle or the mounted machine is out of order, a lane control unit will be controlled for there to be no mounted machine, or to regard it as mounted machine failure, and to display on this purport and a drop, if the time when it is more fixed than the time of a vehicle entry is set and a radio is not performed to within a time [this]. The timing of this fixed time calculates the average of the timing to which a radio is performed from a vehicle entry by the number of cases of the newest instrumentation data in a lane control unit, and since it updates to the present condition data of the regular newest and fixed time is set, exact decision is made and it is displayed.

[0013] Thus, by this invention, to the vehicle or the mounted machine failure vehicle which does not have a mounted machine, an unusual information can be expressed to a drop as suitable timing, and it is enabled to notify an operator.

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EXAMPLE

[Example] Hereafter, the example of this invention is concretely explained based on a drawing. Drawing 1 is a perspective diagram of the tariff **** system of the toll road concerning one example of this invention. The Hertzian wave to which a lane control unit and 6 carry out a drop, and, as for 8, the vehicle which 1 runs a lane 7 in drawing and advances, the mounted machine with which 2 was carried in the vehicle 1, the antenna with which 3 was installed in the on-the-street side, the vehicle detector in which 4 detects an entry of a vehicle 1, and 5 carry out the radio between an antenna 3 and the mounted machine 2, and 10 are the vehicle detection signals (entry) which the vehicle

[0015] In the tariff **** system of such a configuration, the vehicle detection signal (entry) 10 is transmitted to the lane control unit 5 from the vehicle detector 4 by the vehicle 1 which passes through a toll road advancing into a tollgate, and a vehicle 1 advancing into the vehicle detector 4. The lane control unit 5 is receiving the vehicle detection signal (entry) 10, and discharges Hertzian wave 8 from an antenna 3.

[0016] A radio is performed between the mounted machines 2 and the antennas 3 which were carried in the vehicle 1, the identification number beforehand memorized by the memory in the mounted machine 2 is checked, if normal, a toll will be deducted from the amount-of-money data of the mounted machine 2, and an operator is notified of a communication result by displaying a balance frame and a toll on a drop 6. Moreover, as a result of checking an identification number, the case of the mounted machine with the report of the loss of an article, and when the amount of money is insufficient, the purport is displayed with a drop 6, and an operator is notified.

[0017] Next, the case where it is the vehicle with which the vehicle or the mounted machine 2 which does not have the mounted machine 2 used as the characteristic feature of this invention is out of order is explained in detail. In drawing 1, if the vehicle with which the vehicle or the mounted machine 2 which does not have the mounted machine 2 is out of order advances into the vehicle detector 4, it will be transmitted to the lane control unit 5, and the vehicle detection signal (entry) 10 will discharge Hertzian wave 8 from an antenna 3. However, since a radio is not performed between antennas 3 since there is no mounted machine 2 in a vehicle or it is out of order, and a communication result cannot be displayed on a drop 6, an operator cannot be notified.

[0018] Then, after receiving the vehicle detection signal (entry) 10 to such a vehicle, when a communication is not performed between an antenna 3 and the mounted machine 2 within a certain fixed time "A" Although the technique of notifying an operator can be considered by judging it as the vehicle which does not have the mounted machine 2, or a damaged vehicle, and displaying the purport on a drop 6, it is difficult to decide on fixed time "A" by the run states (traffic congestion, nonstop, etc.) of a vehicle.

[0019] For example, at the time of commutation rushes in the mornings and evenings, when the vehicle with short ** past ** and the normal mounted machine 2 in fixed time "A" runs by going slowly, it carries out a vehicle [which does not have the mounted machine 2], and misjudgment exception. Moreover, since an unusual purport will be displayed after passing a drop 6 to the vehicle which does not have the mounted machine 2, or the damaged vehicle if fixed time "A" is too long, since a nonstop high-speed run is performed when there are few traffic flows of night,

an operator can be notified.

[0020] Then, the timing with the radio result between the vehicle detection signal (entry) 10, and an antenna 3 and the mounted machine 2 is measured, the run state of a vehicle is judged, and if it decides on fixed time "A", the above-mentioned problem is solvable. The decision technique of this fixed time "A" is explained below according to the ***** chart of drawing 3.

[0021] Drawing 3 shows the timing of the radio between the vehicle detection signal (entry) 10 and the antenna 3 which are outputted from the vehicle detector 4, and the mounted machine 2, and, in a high-speed run, (b) of (a) is a thing in low and a medium-speed run. x of drawing 3 is ***** from the start point in time of the vehicle detection signal (entry) 10 to radio start, and this timing x serves as the value which changed with run states of every vehicle and a vehicle. Generally, ***** at the time of a high-speed run, and low and a medium-speed run is in the relation of $x_1, x_2 < x_3$, and x_4 .

[0022] The value of fixed time "A" is computed and determined by measuring these two ***** x with the lane control unit 5 to the vehicle which usually has the mounted machine 2. An example of a calculation formula is shown below.

[0023]

[Equation 1]

$$A = a \frac{\sum_{i=1}^i x_i}{i}$$

[0024] a is a coefficient, and sets to $1 \leq a$, and i is the number of cases from the newest instrumentation data. An average of ***** x for the i newest instrumentation data is taken, and fixed time "A" is computed by applying coefficient a. the vehicle with which the vehicle which a mounted machine does not carry if timing x which was suitable for the vehicle run state when updating this fixed time "A" to the new value again serially is always obtained and performs a radio by such timing x, or the mounted machine is out of order -- judging -- a drop 6 -- the -- a purport display can be carried out

[0025] In the tariff **** system of such an example In the vehicle detector 4, detect an entry of a vehicle 1, and the timing of the radio of this vehicle detection signal (entry) 10 and antenna 3, and the mounted machine 2 is measured with the lane control unit 5. Since fixed time "A" was computed in quest of the average of timing by the number of cases of the newest instrumentation data The former and configuration, without changing only by bringing the position of the vehicle detector 4 close to the communication region of an antenna 3 This can be distinguished also to the vehicle with which the vehicle or the mounted machine which does not have a mounted machine is out of order, the unusual information on a mounted machine can be displayed on a drop 6, and it is enabled to also notify an operator.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the perspective diagram of the tariff **** system of the toll road concerning one example of this invention.

[Drawing 2] As for (a), in a high-speed run of a vehicle, by the timing chart of the vehicle detection signal concerning one example of this invention, and a radio, (b) shows the case of low and a medium-speed run.

[Drawing 3] It is the perspective diagram of the tariff **** system of the conventional toll road.

[Description of Notations]

1 Vehicle

2 Mounted Machine

3 Antenna

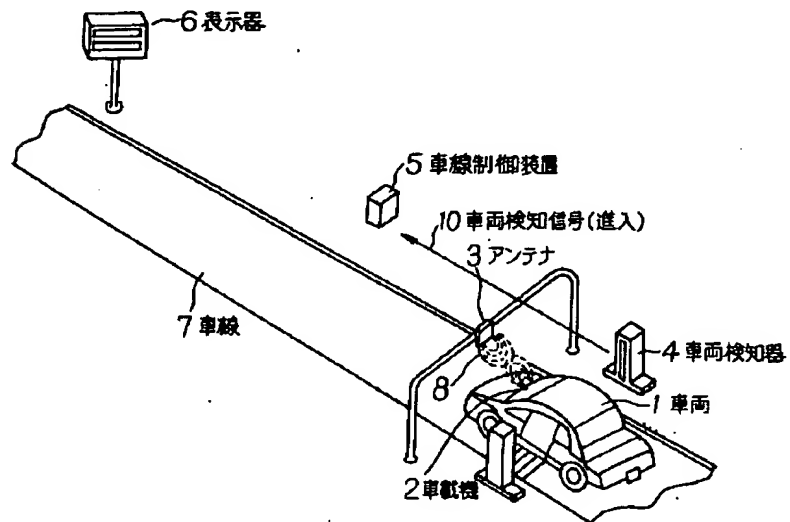
4 Vehicle Detector

5 Lane Control Unit

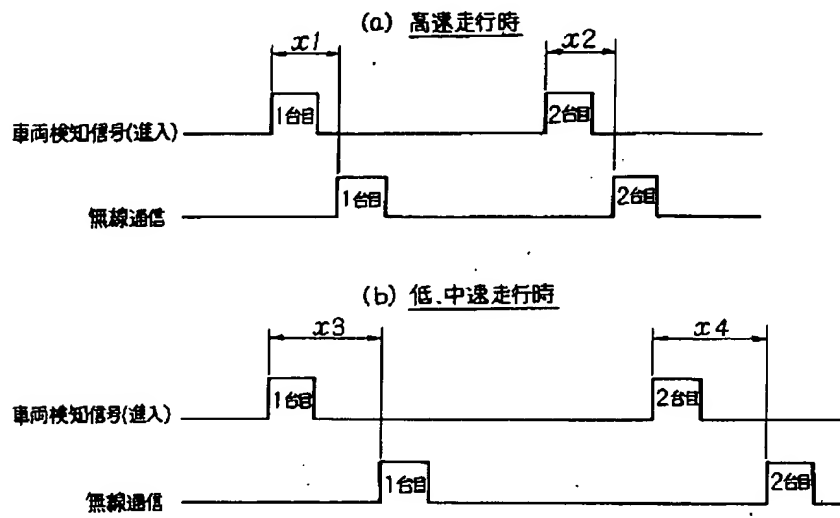
6 Drop

7 Lane

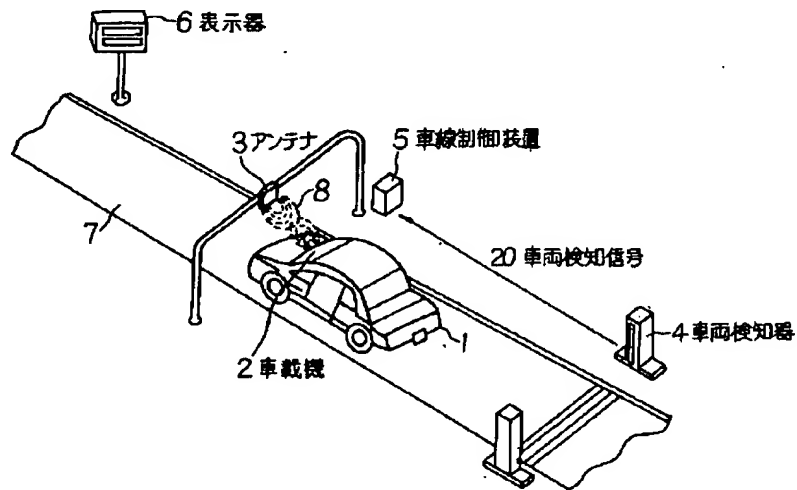
[Translation done.]

Drawing selection Drawing 1

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Drawing selection Drawing 2

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Drawing selection ☒

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